CHAPTER 4

LESSON OUTLINES FOR DRIVING OPERATIONS

LESSON TITLE: IDENTIFY MAJOR COMPONENTS, CAB CONTROLS, INSTRUMENTS, AND INDICATORS

TASK NUMBER: 551-721-1352 (Perform Vehicle Preventive Maintenance Checks and Services [PMCS])

A. TRAINING OBJECTIVE.

TASK: Identify major components, cab controls, instruments, and indicators.

CONDITION: Given instruction on the M977/M978 HEMTT and a requirement to identify and explain the functions of major components, cab controls, instruments, and indicators.

STANDARDS: Correctly identify and explain the functions of major components, cab controls, instruments, and indicators.

B. INTERMEDIATE TRAINING. None.

C. ADMINISTRATIVE INSTRUCTIONS.

1. Training time: As scheduled.
2. Training location: Scheduled classroom.
3. Training type: Conference.
4. Students: Scheduled personnel.
5. Principal and assistant instructors required: One primary instructor.
6. Training aids and equipment: Overhead projector, screen, and transparencies.
7. References: TM 9-2320-279-10-1.

D. SEQUENCE OF ACTIVITY.

1. Introduction:
    a. Interest device.
    b. Tie-in.
    c. Lesson objective (paragraph A).
    d. Procedures:
        (1) Explanation.
        (2) Summary.

2. Explanation:

NOTE: The instructor will emphasize the importance of the safety of getting into and out of the cab (maintain three points of contact), observing all warnings, and using seat belts.

Transparency HEMTT 1-1

a. Major components (all models).

(1) Personnel cab. Provides protection from the weather for the crew and the vehicle controls, gauges, and indicators.

(2) Engine compartment. Engine supplies power to move the vehicle and operate the equipment and accessories.

(3) Ether canister. Contains ether for use as cold weather starting aid.

(4) Air cleaner. Filters out dust and debris from air entering the air induction system.

(5) Tire davit (shown assembled). Used to raise and lower the spare tire.

(6) Hydraulic reservoir. Stores, cools, and filters the oil used in the hydraulic and power steering systems.

(7) Fuel tank. Stores fuel used to operate the engine. Receives excess fuel not used by the engine's fuel injection system.

(8) No. 3 driving axle. Supports weight of the vehicle and transmits power to the hubs to turn the rear wheels.

(9) No. 4 driving axle. Supports weight of the vehicle and transmits power to the hubs to turn the rear wheels.

Transparency HEMTT 1-2

(10) Tire davit (shown in stowed position). Used to raise and lower the spare tire.

(11) Air dryer. Used to remove dirt and moisture from compressed air before air enters the air reservoirs.

(12) Fuel-water separator. Acts as the primary fuel filter and removes any water from the fuel before entering the engine.

(13) Battery box. Houses and protects the four storage batteries.

(14) No. 1 driving axle. Controls the direction of the vehicle when in motion. When needed, transmits power to the hubs to turn the wheels (8X8 drive).

(15) No. 2 driving axle. Controls the direction of the vehicle when in motion. When needed, transmits power to the hubs to turn the wheels (8X8 drive).

(16) Air reservoirs. Used to store the air system air.

(17) Self recovery winch (installed on approximately 20 percent of the HEMTT fleet). Used to help the vehicle pull itself free of obstructions.

Transparency HEMTT 1-3

b. Major components (M977).

(1) Stowage boxes. Used to stow BII.

(2) Access ladder. Used by the operator to clean windows, check oil, or perform other tasks requiring access to parts of the vehicle out of normal reach.

(3) Cargo body. Used to carry palletized ammunition. Tiedowns are provided to allow the ammunition pallets to be tied down.

(4) Material handling crane. Used to load and unload cargo.

Transparency HEMTT 1-4

c. Major components (M978).

(1) Stowage box. Used to stow fuel cans or fuel hoses.

(2) Tank. Stores up to 2,500 gallons of automotive, diesel, or jet fuel.

(3) Stowage box. Used to stow BII.

(4) Tank access ladder (shown in stowed position). Provides access to the top of the tank.

(5) Pump module. Contains the fuel servicing controls, indicators, and connections.

(6) Access ladder. Used by the operator to clean windows, check oil, or perform other tasks requiring access to parts of the vehicle out of normal reach.

(7) Stowage compartment. Used to stow the 3-inch suction hose assembly.

(8) Chock stowage box. Used to stow the wooden wheel chocks.

(9) Dipstick stowage tube. Used to stow the tank dipstick.

Transparency HEMTT 1-5

d. Foot controls and lower window.

(1) Headlight dimmer switch. Press switch to raise or lower headlight beams. High beam indicator will light up red when high beams are on.

(2) Service brake pedal. Applies the service brakes. When towing a trailer, if vehicle is properly coupled to the trailer, the trailer service brakes will also operate when vehicle service brakes are applied.

(3) Accelerator pedal. Controls the engine and vehicle speed.

(4) Floor window. This is for over-crest visibility (enables the driver to see what is on the down side of a crest). Also, the metal horizontal bar across the center of the window is 48 inches, the maximum fording depth of the HEMTT.

Transparency HEMTT 1-6

e. Cab mounted hand controls.

(1) Cab door window glass regulator (one on each door). Raises and lowers the window glass.

(2) Air horn chain. Pull down to sound the air horn. Let go to silence the air horn.

(3) Cab door inside release handle (one on each door). Pull to open the cab door from inside the cab.

(4) Cab door handle (one on each door). Pull to close the cab door from inside the cab.

Transparency HEMTT 1-7

f. Steering column mounted controls.

(1) Emergency flasher control. For the hazard warning flashers (4-way) to operate, the light switch must be in the stop light or service drive position. To turn on the hazard warning flashers, move the turn signal lever to the right turn position, press the hazard tab down, and push the turn signal lever up as far as it will go. To turn the hazard warning flashers off, push the turn signal lever down to the center position.

(2) Steering wheel. This is used to control the direction of the vehicle. Grasp the steering wheel on opposite sides (such as the 3 o'clock and 9 o'clock positions) with your palms facing inward.

(3) Horn button. It sounds the electric horn when pressed.

(4) Turn signal lever. Push up to signal a right turn and pull down to signal a left turn. When the turn is completed, manually return the lever to the center position (turn signal will not self-cancel).

Transparency HEMTT 1-8

g. Tunnel panel controls.

(1) Transmission range selector. Used to select the transmission range. The transmission can be shifted manually to control the vehicle speed.

(a) Use R to move the vehicle backwards.

(b) Use N to start the engine, park the vehicle, shift the transfer case, and operate auxiliary equipment (crane, winch, and/or tanker pump).

(c) Use D to drive in normal conditions and move forward from a stop. The transmission will up shift and down shift automatically.

(d) Use 3 (third range) to drive in off-road conditions, drive in city traffic, and haul a heavy load. Restricts up shifts to no higher than 3rd gear.

(e) Use 2 (second range) when pulling through mud or snow and climbing or descending moderate grades. Restricts up shifts to no higher than 2d gear.

(f) Use 1 (first range) when greatest traction and maximum engine braking is needed, such as driving through deep mud or snow and climbing or descending steep grades.

(2) Selector detent button. Must be pushed in to move the transmission range selector.

(3) STE/ICE receptacle. Receptacle for connecting simplified test equipment/internal combustion engine.

(4) Transfer case shift lever. Used to select HI range or LO range. Center position is N.

NOTE: The trick to shifting the transfer is to stop the truck, take your right hand and apply pressure to the transfer case shift lever, while at the same time you shift the transmission range selector to N with your left hand. Do not force the transfer case shift lever as this will only cause damage to the shift collars. The collars must be aligned before the transfer case will go into gear. If the transfer case shift lever is hard to move, shift the transmission range selector to D, then back to N. If the transfer case will not shift, select R then N and try to shift the transfer case lever again. If the transfer case will still not shift, select D, then back to N.

(a) Set the transfer case shift lever to HI range for highway driving and secondary roads.

(b) Set the transfer case shift lever to LO range for adverse off-road driving and steep grades.

(5) Self recovery winch lever (if equipped with winch). Used to pay out and take up winch cable. Center position is N.

Transparency HEMTT 1-9

h. Instrument panel controls and indicators.

(1) Parking brake control. Push in to release the vehicle brakes and pull to apply the vehicle brakes. It also automatically applies the parking brakes if air pressure goes below 35 PSI (spring brakes).

(2) Left turn indicator. Flashes green when the left turn signal is on.

(3) Speedometer/odometer. Shows the vehicle traveling speed in MPH and KPH and the total miles traveled.

(4) High beam indicator. Lights up red when the vehicle headlights are on high beam.

(5) Tachometer/hourmeter. Shows the engine operating speed RPM X 100 and the total operating time in hours.

(6) Right turn indicator. Flashes green when the right turn signal is on.

(7) Fuel gauge. Shows the amount of fuel in the fuel tank.

(8) Transmission temperature gauge. Shows the transmission fluid temperature in degrees F and degrees C.

(9) Oil pressure gauge. Shows the engine oil pressure in PSI and kPa.

(10) Water temperature gauge. Shows the engine coolant temperature in degrees F and degrees C.

Transparency HEMTT 1-10

(11) Oil-water indicator. Lights up red when the engine oil pressure is too low or when the engine coolant temperature is too high.

(12) INTER-AXLE DIFF. LOCK indicator. Lights up red when the traction control is in the INTER-AXLE DIFF. LOCK position.

(13) 8X8 drive indicator. Lights up orange when the traction control is in the 8X8 drive position or when the transfer case is in low (low also puts vehicle in 8X8 drive).

(14) Air filter restriction indicator. Shows condition of the air cleaner filter. Indicator window shows green when the filter is clean; yellow as filter becomes restricted; and red when the filter becomes clogged. Vacuum inches H_2O window shows degree of restriction.

(15) Traction control. In left position (INTER-AXLE DIFF. LOCK) locks interaxles in front and rear tandems. In right position (8X8 drive) engages transfer case drive to front axle.

(16) Ether start control. Injects ether into engine intake manifold for cold weather starting.

Transparency HEMTT 1-11

(17) Engine stop switch. Used to stop the engine. It is a spring activated toggle switch that returns to the run position when released.

(18) Engine start switch. Three position switch. Straight up is the off position. On position operates the electrical system. Start position operates the engine cranking circuit. When switch is released after the engine starts, the switch will return to the on position.

(19) Air indicator. Lights up red and will remain lit until the airbrake air pressure in each section of the dual system is between 55 and 75 PSI. The buzzer

will sound whenever the indicator is lit.

(20) Air pressure gauge. Shows the air pressure (in PSI and kPa) in both sections of the airbrake system. The green needle shows the front section air pressure. The red needle shows the rear section air pressure.

(21) Battery gauge. Shows the state of charge of the batteries and the alternator voltage output.

(22) Amperes gauge. Shows the alternator output in amperes.

(23) Trailer air supply control. Charges the trailer airbrake system.

Transparency HEMTT 1-12

i. Heater compartment controls and indicators.

(1) Trailer handbrake control (johnson bar or trailer hand valve). Is used to apply and release the trailer brakes separate from the vehicle service brakes. It should only be used to test the trailer brakes. Using it when driving will cause the trailer to skid. It can be used for coupling and uncoupling trailers without spring brakes.

(2) Jacobs engine brake on-off switch. Supplies or shuts off electrical power to the Jacobs engine brake.

(3) Jacobs engine brake indicator. Lights up green when the Jacobs engine brake on-off switch is in the on position.

(4) Jacobs engine brake high-low switch. Selects the number of engine cylinders used for engine braking action. The high position provides maximum braking (8 cylinders). The low position provides less engine braking (4 cylinders).

(5) Air control. Controls the amount of outside air entering the cab through the fresh air vent.

(6) Fan control. Controls the speed of the heater fan.

(7) Heat control. Controls the amount of hot air entering the cab.

(8) Defrost control. Controls the amount of hot air blown on the windshield.

(9) PTO engage indicator. Lights up red when the PTO engage control is in the on position.

(10) Crane outrigger extended indicator. Lights up red when the outriggers are extended (M977).

(11) PTO engage control. Supplies or shuts off electrical power to the power takeoff.

(12) Utility outlet. Supplies electrical power to operate the beacon light.

(13) Light control. Controls all electrical power to all parts of the vehicle.

(14) Washer control. Controls spray of cleaning fluid on the windshield.

(15) Wiper control (right). Controls operation of the right windshield wiper.

(16) Wiper control (left). Controls operation of the left windshield wiper.

(17) Work light switch (NA). M977/M978 not equipped with work lights.

(18) Domelight switch. Up position turns the cab domelight on. Down position turns the cab domelight off.

(19) Clearance lamps switch. Up position turns clearance lamps on. Down position turns the clearance lamps off.

Transparency HEMTT 1-13

j. Operator and crew seat adjustment controls.

NOTE: Controls on both seats are the same.

(1) Seat belt. Secures personnel in seat.

(2) Seat connector strap. Secures seat to cab frame.

(3) Height adjustment control. Use to adjust the seat height.

(4) Forward/backward adjustment control. Use to move the seat forward and backward on slides.

(5) Ride adjustment control. Use to adjust the seat tension and ride firmness.

3. Practical exercise: None.

4. Evaluate: Students are evaluated daily during driving tasks and are tested during the EOCCT.

5. Summary:

a. Recap main points.

b. Allow for questions.

c. Clarify questions.

d. Give closing statement.

6. Retraining: Training is reinforced during daily driving tasks.

E. SAFETY RESTRICTIONS. None.

F. ADDITIONAL COMMENTS AND INFORMATION. Recommended instructional time is 1 hour (conference).

LESSON TITLE: KNOW ENGINE START AND SHUT OFF PROCEDURES

TASK NUMBER: 551-721-1366 (Drive Vehicle with Automatic Transmission)

A. TRAINING OBJECTIVE.

TASK: Know engine start and shut off procedures.

CONDITION: Given instruction on the M977/M978 HEMTT and a requirement to locate the controls and explain the engine start and shut off procedures.

STANDARDS: Correctly locate the controls and explain the engine start and shut off procedures.

B. INTERMEDIATE TRAINING. None.

C. ADMINISTRATIVE INSTRUCTIONS.

1. Training time: As scheduled.

2. Training location: Scheduled classroom.

3. Training type: Conference.

4. Students: Scheduled personnel.

5. Principal and assistant instructors required: One primary instructor.

6. Training aids and equipment: Overhead projector, screen, and transparencies.

7. References: TM 9-2320-279-10-1.

D. SEQUENCE OF ACTIVITY.

1. Introduction:

a. Interest device.

b. Tie-in.

c. Lesson objective (paragraph A).

d. Procedures:

(1) Explanation.

(2) Summary.

2. Explanation:

NOTE: This lesson will emphasize correct engine start and shut off techniques to be used with the HEMTT. The instructor will review special cautions which will increase vehicle and component longevity.

Transparency HEMTT 2-1

a. Engine start.

(1) Ensure parking brake control [1] is pulled out.

(2) Ensure transmission range lever [2] is set to N.

CAUTION

Do not press the ether start button more than three times in a single starting attempt. Failure to observe this caution could cause severe engine damage.

(3) To use the ether start button [3] press for three seconds, wait three seconds more before using it again or turning the engine switch to start. If outside temperature is above 45 degrees F, go to step 4. Press ether start button as indicated below:

(a) One time for temperatures between +10 degrees F to +45 degrees F.

(b) Two times for temperatures between -10 degrees F to +10 degrees F.

(c) Three times for temperatures between -10 degrees F to -25 degrees F.

Transparency HEMTT 2-2

CAUTION

Do not turn the engine start switch to the start position while the engine is running. Engine or starter damage could result.

(4) Turn the engine switch [4] to start for about 10 seconds or until the engine starts. If the vehicle fails to start, wait 15 seconds before next attempt to allow starter to cool. Release the switch. The switch will spring back to the on position. The air pressure indicator [5] may light and buzzer may sound.

NOTE: Repeat steps 3 and 4 up to seven times. If the engine fails to start after eight starting attempts, notify organizational maintenance.

CAUTION

If the oil pressure gauge does not show engine oil pressure within 10 to 15 seconds after starting the engine, shut down immediately. Notify organizational maintenance. Lack of lubrication may damage the engine.

CAUTION

Do not operate the engine above 1,000 RPM during warm up until the oil pressure gauge indicates 40 to 60 PSI at 800 to 1,000 RPM. Lack of lubrication may damage the engine.

(5) Check that oil pressure gauge [6] reads 5 to 10 PSI or more at idle.

Transparency HEMTT 2-3

(6) Press accelerator pedal [7] until tachometer [8] indicates 800 to 1,000 RPM.

(7) Run engine at 800 to 1,000 RPM for about 3 minutes.

(8) Check that oil pressure gauge reads 40 to 60 PSI at 800 to 1,000 RPM. A cold engine may read above 30 PSI while a hot engine may read as low as 5 PSI at idle.

NOTE: If the red and green needles on the air pressure gauge do not read 60 to 120 PSI after warm-up, shut off the engine and notify organizational maintenance.

(9) Check that air pressure gauge [9] reads 60 to 120 PSI. The air pressure indicator [5] will light up and buzzer will sound until both needles reach 60 to 75 PSI. The minimum air pressure required during operation is 100 PSI.

Transparency HEMTT 2-4

(10) Check that fuel gauge [10] shows enough fuel to complete the mission.

(11) Check that water temperature gauge [11] does not read over 230 degrees F.

NOTE: The water temperature gauge may not show a reading until after extensive operation.

(12) Check that battery gauge [12] reads between 24 and 28 volts.

(13) Check that amperes gauge [13] shows a positive reading.

(14) Check that air filter restriction indicator [14] shows green. If the indicator shows yellow or red, press the reset button [15]. If the indicator still shows yellow and vacuum inches H_2O window shows 18 or indicator still shows red, shut off the engine and clean the air filter elements.

Transparency HEMTT 2-5

b. Engine shut off.

(1) Bring the vehicle to a complete stop.

(2) Apply the parking brake. Pull to apply.

(3) Shift the transmission to N.

(4) Run the engine [2] at 800 to 1,000 RPM for 3 to 5 minutes. This continues oil circulation to cool turbocharger, which is turning at about 67,000 RPM.

(5) Idle the engine for 30 seconds.

(6) Shut off all accessories to include lights.

(7) Hold the engine stop switch [3] all the way down until the engine shuts down. Buzzer will sound and oil-water indicator [4] will light up.

(8) Let go of the engine stop switch [3].

(9) Turn the engine switch to off [5]. Buzzer and oil-water indicator [4] will go off.

3. Practical exercise: None.

4. Evaluate: Students are evaluated daily during driving tasks and are tested during the EOCCT.

5. Summary:

    a. Recap main points.

    b. Allow for questions.

    c. Clarify questions.

    d. Give closing statement.

6. Retraining: Training is reinforced during daily driving tasks.

E. SAFETY RESTRICTIONS. None.

F. ADDITIONAL COMMENTS AND INFORMATION. Recommended instructional time is 0.5 hours (conference).

LESSON TITLE: OPERATE ENGINE BRAKE (JAKE BRAKE)

TASK NUMBER: 551-721-1366 (Drive Vehicle with Automatic Transmission)

A. TRAINING OBJECTIVE.

TASK: Operate the engine brake.

CONDITION: Given instruction on the M977/M978 HEMTT and a requirement to locate the controls and explain the operation of the engine brake.

STANDARDS: Correctly locate the controls and explain the operation of the engine brake.

B. INTERMEDIATE TRAINING. None.

C. ADMINISTRATIVE INSTRUCTIONS.

1. Training time: As scheduled.

2. Training location: Scheduled classroom.

3. Training type: Conference.

4. Students: Scheduled personnel.

5. Principal and assistant instructors required: One primary instructor.

6. Training aids and equipment: Overhead projector, screen, and transparencies.

7. References: TM 9-2320-279-10-1.

D. SEQUENCE OF ACTIVITY.

1. Introduction:

a. Interest device.

b. Tie-in.

c. Lesson objective (paragraph A).

d. Procedures:

(1) Explanation.

(2) Summary.

2. Explanation:

Transparency HEMTT 3-1

a. How the engine brake (Jake brake) works. The principle behind the engine brake is very simple. It is a hydraulically operated device that converts a power-producing diesel engine into a power-absorbing retarding mechanism. In order to understand how the

engine brake provides its strong retarding power, compare the engine cycles with and without an engine brake. For this purpose, the illustrations pertain to a four-cycle engine. However, the engine brake is effective on both 2- and 4-cycle diesels.

(1) During the intake stroke:

(a) Without engine brake [1]: The intake valve is opened and air is pulled into the cylinder.

(b) With engine brake [1A]: Same as above.

(2) During the compression stroke:

(a) Without engine brake [2]: Air is compressed to between 500 and 1,000 PSI and heat rises to about 1,000 degrees F. Fuel is injected and combustion occurs. This results in a pressure rise to some 1,500 PSI with a corresponding increase in temperature.

(b) With engine brake [2A]: Air is compressed with corresponding increases in pressure and temperature. Near top dead center, the engine brake's slave piston opens the exhaust valve and the compressed air mass (representing potential energy) is released through the exhaust system. (Note black arrows in illustrations [2A] and [3A]). No combustion occurs since the engine brake operates only when the engine is in a no fuel (foot completely off accelerator) mode.

(3) During the power stroke:

(a) Without engine brake [3]: The high pressure resulting from the combustion of the fuel/air mixture forces the piston down, imparting power to the drivetrain.

(b) With engine brake [3A]: No positive power is produced since the compressed air mass was released via the exhaust system during the modified compression stroke. The energy required to return the piston to its bottom position is now derived from the momentum of the vehicle. It is this 2-step process--elimination of the compressed air and use of vehicle momentum to move the piston--which develops the engine brake's retarding capabilities.

(4) During the exhaust stroke:

(a) Without engine brake [4]: Upward motion of the piston forces exhaust gases out of the cylinder.

(b) With engine brake [4A]: Any remaining air is forced out of the cylinder.

Transparency HEMTT 3-2

(5) Discuss the system briefly. There are three basic controls:

(a) The engine brake high/low switch [1]. Selects the number of engine cylinders used for braking. High position provides maximum

braking (all eight cylinders). Low position provides less engine braking (four cylinders).

(b) The engine brake on/off switch [2]. Supplies or shuts off electrical power to the engine brake.

(c) Accelerator pedal [3]. This is the activation switch. Automatically pre-selected to cut in when foot is taken off accelerator pedal (no fuel position).

b. Location of control and how to operate. The engine must be warmed prior to using or checking the operation of the engine brake. The reason for this is that the engine brake uses engine oil to operate. The oil must be warm enough to flow through the tiny orifices and valves that cause the engine brake to operate.

(1) The engine brake high/low switch [1] has two positions, low and high. Set the switch to low.

(2) Set the engine brake on/off switch [2] to on. The engine brake indicator light [4] will come on.

(3) Lift foot off the accelerator pedal [3]. The engine brake will automatically slow the vehicle.

(4) Optimum braking occurs with engine speed between 1,650 and 2,100 RPM [7]. Select appropriate transmission range [6] and engine brake [1] setting to maintain desired effect. Do not over rev engine during braking.

(5) If more braking is required, set the engine brake high/low switch [1] to high.

WARNING

Apply the engine brake only when the vehicle tires have good traction. Use of the engine brake on slick surfaces can cause the vehicle to skid and cause injury or death.

NOTE: Service (wheel) brakes must be used in addition to the engine brake for maximum braking. The engine brake is a supplement to the service brakes. The engine brake is a vehicle slowing device, not a vehicle stopping device.

Transparency HEMTT 3-3

c. Guidelines for use of engine brake. In some areas (cities and municipalities) it is illegal to use the engine brake. This is because of the exhaust noise when the engine brake is used. Check local laws and regulations before using the engine brake.

(1) Do not use the engine brake until the engine has warmed.

(2) Select the proper transmission gear to keep engine speed high, but not beyond governed speed (1,650 to 2,100 RPM).

(3) Always be aware of the engine brake high/low switch and on/off switch positions.

(4) Use the proper brake position for existing road conditions.

(5) Get acquainted with the braking feel to make the best use of the system.

(6) The gear used going upgrade is usually good for going down.

(7) Always shut the on/off switch off after use.

3. Practical exercise: None.

4. Evaluate: Students are evaluated daily during driving tasks and are tested during the EOCCT.

5. Summary:

a. Recap main points.

b. Allow for questions.

c. Clarify questions.

d. Give closing statement.

6. Retraining: Training is reinforced during daily driving tasks.

E. SAFETY RESTRICTIONS. None.

F. ADDITIONAL COMMENTS AND INFORMATION. Recommended instructional time is 0.5 hours (conference).

ENGINE BRAKE (JAKE BRAKE) INFORMATION SHEET

1. Each M977/M978 HEMTT is equipped with a retarder system that enables the engine to act as a brake. The engine brake should be used for descending grades or in any situation where slowing is required but not on slippery road surfaces (such as rain, snow, sleet, or ice). Using the engine brake on slippery surfaces can cause the vehicle to skid. The engine brake is most effective between 1,650 to 2,100 RPM.

2. Never allow the engine speed to drop below 1,650 RPM with the engine brake applied. This will cause serious transmission damage.

CAUTION

The engine brake loses effectiveness in controlling engine RPM and vehicle speed when being pushed by a load down a grade. Use service brakes and manually downshift range selector as necessary on long grades to keep vehicle speed under control and engine speed between 1,650 to 2,100 RPM.

3. The following procedures should be followed when the vehicle tires have good traction:

a. Select a gear that will allow the engine, with the engine brake applied, to control the truck speed with the engine at or below 2,100 RPM and service brakes not applied. This means as you approach a downgrade, progressively select a gear; which when combined with the engine brake, will allow you to maintain an engine speed of 1,650 to 2,100 RPM.

b. As engine speed exceeds 2,100 RPM, apply the service brakes one time to slow the engine speed, turn off the engine brake, downshift one gear (if you are in D, you would downshift to 3 and reapply the engine brake). Repeat this procedure until the engine speed can be maintained between 1,650 to 2,100 RPM.

c. If the engine over speeds (above 2,100 RPM) apply the service brakes one time to slow the vehicle speed and regain control.

WARNING

Failure to follow the downhill driving procedures may cause you to lose vehicle control and result in severe injury or death to personnel.

CAUTION

Excessive use of the service brake to control downhill speed will result in the loss of braking power because of heat buildup.

WARNING

Rapid operation repeatedly of service brakes will consume compressed air supply and cause automatic spring brake application. Failure to follow proper service brake operating procedures may cause serious injury or death to personnel.

4. The instructor must emphasize and reemphasize the importance of the proper downhill braking procedures and the use of the engine brake, especially on slippery surfaces, as outlined above. He must instill in the drivers that if these procedures are not followed, death or serious injury can result.

5. Also, the instructor must explain to the students that braking ability and braking techniques are different with a loaded vehicle and the driver must think and plan ahead. The driver must increase his following distance and reduce his speed consistent with road and traffic conditions.

LESSON TITLE: PERFORM OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

TASK NUMBER: 551-721-1352 (Perform Vehicle Preventive Maintenance Checks and Services [PMCS]).

A. TRAINING OBJECTIVE.

TASK: Perform operator PMCS on the HEMTT vehicle.

CONDITION: Given instruction, DA Form 2404, pencil, TM 9-2320-279-10-1, equipment records folder, rags, lubricants, coolant, and a HEMTT vehicle with BII.

STANDARDS: Inspect the vehicle according to the PMCS tables listed in TM 9-2320-279-10-1. Correct all faults within the operator's level of maintenance and record all others legibly on DA Form 2404. If no faults are found, make the necessary entries on DA Form 2404.

B. INTERMEDIATE TRAINING. None.

C. ADMINISTRATIVE INSTRUCTIONS.

1. Training time: As scheduled.

2. Training location: Classroom and motor pool as scheduled.

3. Training type: Conference, demonstration, and practical exercise.

4. Students: Scheduled personnel.

5. Principal and assistant instructors required: One primary instructor for the conference, one assistant instructor for each two students for the demonstration, and one assistant instructor for each two students for the practical exercise.

6. Training aids and equipment: Television, VCR, TVT 55-23, hearing protection, rags, lubricants, coolant, DA Form 2404, pencil, TM 9-2320-279-10-1, equipment records folder, and a HEMTT vehicle with BII for each two students.

7. References: AR 385-55, DA Pamphlet 738-750, and TM 9-2320-279-10-1.

D. SEQUENCE OF ACTIVITY.

1. Introduction:

a. Interest device.

b. Tie-in.

c. Lesson objective (paragraph A).

d. Procedures:

(1) Explanation.

(2) Practical exercise.

(3) Summary.

2. Explanation and demonstration:

a. Show TVT 55-23.

b. Demonstrate before-, during-, and after-operation PMCS to students.

3. Practical exercise:

a. Assign students to vehicles and issue TM 9-2320-279-10-1, pencils, DA Form 2404, and equipment records folder. Tell students where rags, lubricants, and coolant are located.

b. Students perform PMCS.

4. Evaluate: Check each student's performance of PMCS.

5. Summary:

a. Recap main points.

b. Allow for questions.

c. Clarify questions.

d. Closing statement.

6. Retraining: Students perform PMCS daily and is reinforced throughout the course. PMCS is tested on the EOCCT.

E. SAFETY RESTRICTIONS.

1. Ensure that all chock blocks are in place when vehicles are parked or maintenance is to be performed.

2. Ensure the transmission is in N, the parking brake is set, and the engine is shut off before leaving the vehicle, when the vehicle is parked, or maintenance is being performed.

3. Ensure all personnel remove all wristwatches, rings, bracelets, neck chains, and any other jewelry before working in or around the HEMTT.

4. Ensure all personnel pay particular attention to the cautions and warnings listed in the operator's manuals.

5. Ensure the driver and ground guides know and understand the hand and arm signals, especially the signal to stop, as outlined in FM 21-305.

6. Ensure ground guide(s) are used when backing.

7. Ensure all backing is conducted at a speed of 5 MPH or less.

8. Do not park the vehicle on a steep grade. Serious injury or death can result or the vent on the M978 tanker may leak.

9. Ensure all personnel wear hearing protection when working in or around a running HEMTT.

10. Ensure all occupants wear seat belts while the vehicle is in operation.

11. Ensure personnel maintain at least three points of contact when mounting or dismounting the vehicle (to include performing PMCS).

12. The vehicle access ladder must be used when performing maintenance. The two hooks on the ladder must be installed in the front skid plate holes, right front fender holes, or left front fender holes as required. When installing or removing the access ladder to or from the right front fender holes, do not hit the fuel-water separator. Hitting the fuel-water separator could cause the glass to break.

13. The vehicle access ladder must be used to mount or dismount the HEMTT cargo body. Install the access ladder in the right front fender holes, climb the ladder, and step into the cargo bed from the right fender.

14. Ensure all personnel are clear of vehicle before engine start is attempted. Operator must visually check to see that all areas of the truck are clear of personnel before attempting to start the engine. Failure to do so could result in serious injury or death to personnel.

15. The radiator is very hot and pressurized during vehicle operation. Let the radiator cool before removing the cap. Failure to comply can result in serious burns.

16. The exhaust pipe and muffler can become very hot during vehicle operation. Be careful not to touch these parts with bare hands or allow the body to come in contact with the exhaust pipe or muffler. Exhaust system parts can become hot enough to cause serious burns.

17. Be careful not to short out battery terminals. Do not smoke or use open flame near batteries. Batteries may explode from a spark. Battery acid is harmful to skin and eyes.

18. Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep a fire extinguisher within easy reach when working with fuel. Do not work on the fuel system when the engine is hot. Fuel can be ignited by the hot engine. When working with fuel, post signs that read: “NO SMOKING WITHIN 50 FEET OF VEHICLE.”

F. ADDITIONAL COMMENTS AND INFORMATION. Recommended instructional time is 2 hours (.25 conference, .75 demonstration, and 1.0 practical exercise). The remaining PMCS is performed throughout the course in conjunction with driving tasks.

LESSON TITLE: DRIVE AN M977/M978 HEMTT

TASK NUMBER: 551-721-1366 (Drive Vehicle with Automatic Transmission)

A. TRAINING OBJECTIVE.

TASK: Drive an M977/M978 HEMTT.

CONDITION: Given instruction, DD Form 1970, DA Form 2404, pencil, TM 9-2320-279-10-1, equipment records folder, rags, lubricants, coolant, a suitable driver training area, an M977/M978 HEMTT with BII, and a requirement to drive the HEMTT; start the vehicle, put the vehicle in motion, read gauges, upshift and downshift the transmission, manipulate the controls, use correct braking procedures, perform basic driving maneuvers to include backing using ground guides, and shut off the engine.

STANDARDS: Drive the vehicle correctly and safely without accident or injury.

B. INTERMEDIATE TRAINING. None.

C. ADMINISTRATIVE INSTRUCTIONS.

1. Training time: As scheduled.

2. Training location: Classroom, motor park, and training area as scheduled.

3. Training type: Conference, demonstration, and practical exercise.

4. Students: Scheduled personnel.

5. Principal and assistant instructors required: One primary instructor for the conference, one assistant instructor for the demonstration, and one assistant instructor for each student for the practical exercise.

6. Training aids and equipment: Television, VCR, TVT 55-26, rags, lubricants, coolant, 40 traffic cones or empty POL drums, DA Form 2404, DD Form 1970, pencil, TM 9-2320-279-10-1, equipment records folder, and an M977/M978 HEMTT with BII for each student.

7. References: AR 385-55, DA Pamphlet 738-750, FM 21-305, and TM 9-2320-279-10-1.

D. SEQUENCE OF ACTIVITY.

1. Introduction:

a. Interest device.

b. Tie-in.

c. Lesson objective (paragraph A).

d. Procedures:

(1) Explanation.

(2) Practical exercise.

(3) Summary.

2. Explanation and demonstration:

NOTE: An instructor will be in the cab whenever a student is driving the HEMTT.

a. Show TVT 55-26.

b. Place vehicle in motion:

(1) Perform before-operation PMCS.

(2) Remove and stow wheel chocks (stowed under spare tire).

(3) For M977 vehicles:

(a) Make sure cargo box end and side panels are in place and secure.

(b) Make sure load, if present, is loaded correctly and tied down to prevent movement.

(c) Make sure MHC and outriggers are secured in their stowed position.

(4) For M978 vehicles:

(a) Make sure manhole cover is closed and latched.

(b) Make sure pump module doors are closed and latched.

(c) Make sure tank access ladder is secured in the stowed position.

(5) Adjust each rear view mirror so back of truck and view of road can be seen.

(6) Install foot rest if required.

(7) Adjust seat as needed.

(8) Adjust seat belt as needed.

WARNING

Ensure all personnel are clear of truck before engine start is attempted. Operator must visually check to see that all areas of the truck are clear of personnel before attempting to start the engine. Failure to do so could result in serious injury or death to personnel.

(9) Start engine and allow it to warm up.

(10) Check all gauges and instruments. Ensure that they are registering normal readings.

(11) Turn on lights as appropriate.

CAUTION

Do not move the transfer case shift lever when the vehicle is moving or when the transmission is in gear. This can cause severe damage to the driveline.

(12) Set the transfer case shift lever to the appropriate range.

(13) Apply the service brake, push in the button on the transmission range selector, and move the transmission range selector to the appropriate range (D, 3, 2, or 1).

(14) Push in the parking brake control to release the brakes.

(15) Release the service brake pedal and slowly press the accelerator pedal until the vehicle reaches the desired speed.

(16) Accelerate, brake, and steer as required.

CAUTION

Do not hold the steering wheel at the full left or right position for longer than 10 seconds. Power steering oil overheating and pump damage can result.

(17) Manually downshift the transmission range selector to match driving conditions.

c. Stop the truck.

(1) Release the accelerator pedal.

(2) Depress the brake pedal.

WARNING

Apply brakes gradually when stopping. A panic stop will cause the vehicle wheels to lock, engine to stall, and power steering failure. Failure to do this can result in injury or death.

WARNING

Rapid operation repeatedly of service brakes will consume compressed air supply and cause automatic spring brake application. Failure to follow proper service brake operating procedures may cause serious injury or death to personnel.

(3) As the vehicle begins to reduce speed, decrease brake pedal pressure.

(4) Stop smoothly by releasing the brake pedal pressure gradually as the stopping rate increases.

(5) After stopping, apply the brake just enough to keep the truck stopped.

d. Backing the truck. Since the driver cannot see directly behind his vehicle, backing is always a dangerous maneuver. Common sense therefore dictates that backing be avoided whenever possible. For example, if the vehicle must be parked, the driver parks so that he will be able to pull forward when leaving. Even though planning ahead can reduce the need to back, almost everyone who drives will have to back on occasion.

These four simple rules will help in backing safely:

(1) Inspect your intended path.

(2) Back and turn toward the driver's side.

(3) Use four-way flashers and horn.

(4) Use ground guide(s).

WARNING

When backing or going forward, ground guides should never stand directly in the vehicle's path. Keep 10 yards between the vehicle and ground guides at the front or rear and at the corners of the vehicle (never directly behind the vehicle). Ground guides must not position themselves between the vehicle being guided and another object where an inadvertent engine surge or momentary loss of vehicle control could cause injury. The vehicle driver will immediately stop the vehicle if he loses sight of ground guides or notes that the guide is dangerously positioned between the vehicle and another object. In such cases, the vehicle driver will secure his vehicle, dismount, and make an on-the-spot correction before commencing operations.

e. Park the truck and shut down the engine.

WARNING

Do not park the truck on a steep grade. Serious personal injury can result or the vent on the M978 tanker may leak.

(1) Align the front tires in a straight ahead position.

(2) Pull out the parking brake control.

(3) Push in the button on the transmission range selector and move the transmission range selector to N.

(4) Chock wheels (for proper placement see chapter 8, FM 21-305).

(5) Increase engine speed to 800 to 1,000 RPM and continue to run engine for 3 to 5 minutes.

(6) Release the accelerator pedal.

(7) Hold the engine stop switch all the way down until the engine shuts down.

(8) Release the engine stop switch.

(9) Turn the engine switch to off.

(10) Turn off the lights.

(11) Perform after-operation PMCS.

f. Give safety briefing to include safety restrictions and ground guide precautions for backing the HEMTT.

g. Demonstrate hand and arm signals required for this exercise.

h. Demonstrate driving within the training area.

3. Practical exercise:

a. Assign students to vehicles and issue TM 9-2320-279-10-1, pencil, DA Form 2404, DD Form 1970, and equipment records folder. Tell students where rags, lubricants, and coolant are located.

b. Students perform before-operation PMCS.

c. Students practice maneuvering the HEMTT through the courses laid out in the training area(s). Sample training areas are in Chapter 5 (Figures 5-1 through 5-7). During-operation PMCS is also conducted at this time.

NOTE: As each student practices driving, an assistant instructor rides in the right seat. The assistant instructor explains driving techniques, ensures the driver is aware of driving situations, and conducts AARs with each driver. Now is the time to pass on valuable experience and correct any bad driving habits.

d. Students perform after-operation PMCS. Ensure all operator entries required on DA Form 2404 and DD Form 1970 are accurate, complete, and legible.

4. Evaluate: Check each student's performance of PMCS and driving.

5. Summary:

a. Recap main points.

b. Allow for questions.

c. Clarify questions.

d. Give closing statement.

6. Retraining: Retrain NO-GOs and slow learners. This can be accomplished using TVT 55-26. Students perform driving tasks daily and are tested on the EOCCT.

E. SAFETY RESTRICTIONS.

1. Ensure that all chock blocks are in place when vehicles are parked or maintenance is to be performed.

2. Ensure the transmission is in N, the parking brake is set, and the engine is shut off before leaving the vehicle, when the vehicle is parked, or maintenance is being performed.

3. Ensure all personnel remove all wristwatches, rings, bracelets, neck chains, and any other jewelry before working in or around the HEMTT.

4. Ensure all personnel pay particular attention to the cautions and warnings listed in the operator's manuals.

5. Ensure the driver and ground guides know and understand the hand and arm signals, especially the signal to stop, as outlined in FM 21-305.

6. Ensure ground guide(s) are used when backing.

7. Ensure all backing is conducted at a speed of 5 MPH or less.

8. Do not park the vehicle on a steep grade. Serious injury or death can result or the vent on the M978 tanker may leak.

9. Ensure all personnel wear hearing protection when working in or around a running HEMTT.

10. Ensure all occupants wear seat belts while the vehicle is in operation.

11. Ensure personnel maintain at least three points of contact when mounting or dismounting the vehicle (to include performing PMCS).

12. The vehicle access ladder must be used when performing maintenance. The two hooks on the ladder must be installed in the front skid plate holes, right front fender holes, or left front fender holes as required. When installing or removing the access ladder to or from the right front fender holes, do not hit the fuel-water separator. Hitting the fuel-water separator could cause the glass to break.

13. The vehicle access ladder must be used to mount or dismount the HEMTT cargo body. Install the access ladder in the right front fender holes, climb the ladder, and step into the cargo bed from the right fender.

14. Ensure all personnel are clear of vehicle before engine start is attempted. Operator must visually check to see that all areas of the truck are clear of personnel before attempting to start the engine. Failure to do so could result in serious injury or death to personnel.

15. The radiator is very hot and pressurized during vehicle operation. Let the radiator cool before removing the cap. Failure to comply can result in serious burns.

16. The exhaust pipe and muffler can become very hot during vehicle operation. Be careful not to touch these parts with bare hands or allow the body to come in contact with the exhaust pipe or muffler. Exhaust system parts can become hot enough to cause serious burns.

17. Be careful not to short out battery terminals. Do not smoke or use open flame near batteries. Batteries may explode from a spark. Battery acid is harmful to skin and eyes.

18. Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep a fire extinguisher within easy reach when working with fuel. Do not work on the fuel system when the engine is hot. Fuel can be ignited by the hot engine. When working with fuel, post signs that read: “NO SMOKING WITHIN 50 FEET OF VEHICLE”.

19. Apply brakes gradually when stopping. A panic stop will cause the vehicle wheels to lock, engine to stall, and power steering failure. Failure to do this can result in injury or death.

20. Rapid operation repeatedly of service brakes will consume compressed air supply and cause automatic spring brake application. Failure to follow proper service brake operating procedures may cause serious injury or death to personnel.

21. Never use the parking brake for normal braking. The wheels will lock up causing a severe skid. A skidding vehicle could result in serious injury or death.

F. ADDITIONAL COMMENTS AND INFORMATION. Recommended instructional time is 8 hours (.5 conference, .5 demonstration, and 7.0 practical exercise, including 1.0 PMCS).

LESSON TITLE: DRIVE THE HEMTT ON THE ROAD (PRIMARY AND SECONDARY)

TASK NUMBER: 551-721-1366 (Drive Vehicle with Automatic Transmission)

A. TRAINING OBJECTIVE.

TASK: Drive an M977/M978 HEMTT (empty, partially loaded [5 tons or 1,250 gallons], and fully loaded) on the road (primary and secondary).

CONDITION: Given instruction, DD Form 1970, DA Form 2404, pencil, TM 9-2320-279-10-1, equipment records folder, rags, lubricants, coolant, designated driving route (improved surfaced and secondary roads), an M977/M978 HEMTT with BII, vehicle loads, and a requirement to drive a designated route (to include making right and left turns, making gradual steering corrections, signal intentions in advance, pass oncoming vehicles, maintain vehicle interval, obey highway warning and regulatory signs, operate the lights as required, monitor gauges and indicator lights, upshift/downshift the transmission through all gear ranges, manipulate the controls, and perform basic driving maneuvers to include downhill braking [using the engine brake] and backing using ground guides).

STANDARDS: Operate the vehicle correctly and safely without accident or injury.

B. INTERMEDIATE TRAINING. None.

C. ADMINISTRATIVE INSTRUCTIONS.

1. Training time: As scheduled.

2. Training location: Motor pool and driver training route (built up and rural areas) as scheduled.

3. Training type: Conference and practical exercise.

4. Students: Scheduled personnel.

5. Principal and assistant instructors required: One primary instructor for the conference and one assistant instructor for each student for the practical exercise.

6. Training aids and equipment: Rags, lubricants, coolant, DA Form 2404, DD Form 1970, pencil, TM 9-2320-279-10-1, equipment records folder, an M977/M978 HEMTT with BII for each student, and vehicle loads.

7. References: AR 385-55, DA Pamphlet 738-750, FM 21-305, and TM 9-2320-279-10-1.

D. SEQUENCE OF ACTIVITY.

1. Introduction:

a. Interest device.

b. Tie-in.

c. Lesson objective (paragraph A).

d. Procedures:

(1) Explanation.

(2) Practical exercise.

(3) Summary.

2. Explanation and demonstration:

NOTE: An instructor will be in the cab whenever a student is driving the HEMTT.

NOTE: The students will be required to drive the vehicle fully loaded, partially loaded, and empty. If three HEMTTs are used, the following arrangement will allow the students to rotate in a round robin fashion:

- One vehicle should be loaded (load should be as close to maximum as possible [11 tons for the M977 and 2,500 gallons for the M978]).
- A second vehicle should be partially loaded (5 to 6 tons for the M977 and 1,250 gallons for the M978).
- The third vehicle should be empty.

NOTE: To prevent loss of cargo or shifting en route:

- On the M977 vehicles, check cargo for blocking and bracing and cargo tiedowns for security before operation and repeatedly during operation.
- On the M978 vehicles, make sure the manhole cover and the pump module doors are closed and latched.

a. Explain putting the vehicle in motion--

(1) On flat roadways.

(2) On upgrades.

(3) On downgrades.

(4) In sand, snow, and on ice.

b. Explain the procedures for braking--

(1) Using the engine brake (Jake brake).

NOTE: For detailed information on the use of the engine brake refer to the lesson outline, Operate Engine Brake (Jake Brake).

(2) Using the service brakes (foot brake).

(3) Driving on flat roadways.

(4) Driving on sand, snow, ice, and wet surfaces.

(5) Using emergency braking procedures.

(6) Downshifting the transmission.

c. Explain procedures for hill climbing--

(1) The engine works hardest when moving a loaded vehicle up a grade. Proper use of gear ranges will shorten the time on hills.

(2) Unless the hill is extreme, begin in gear range D, and depress the accelerator pedal all the way downward. Keep it there as the vehicle moves up the grade. If there is enough power to maintain a satisfactory road speed, remain in this gear range and allow the transmission to upshift and downshift automatically.

(3) As you progress up the hill count the number of downshifts.

NOTE: The automatic transmission is equipped with a lockup clutch which automatically engages after the load is rolling and torque demand is low. This provides increased fuel economy at highway cruising speeds. It automatically releases at lower vehicle speeds. Lockup engagement, like range shifts, may be felt under some conditions and you may hear a slight change in engine sound as RPM drop. A little driving experience will enable you to tell the difference between gear range changes and lockup engagement or disengagement.

(4) When you reach the top of the hill, manually downshift the transmission to the gear that the transmission is in (this was the reason for counting the number of downshifts). This is normally the gear the truck should be in to descend the other side of the hill.

(5) For starting on maximum grades with maximum load (such as vehicle fully loaded), stop the vehicle and shift the transfer to low. Start in gear range 2, depress accelerator pedal to the floor, and manually upshift the lever one range at a time, shifting when engine speed approaches 2,000 RPM.

d. Explain procedures for downhill driving--

(1) Select a “safe” speed that is not too fast for the following:

- Total weight of the vehicle and cargo.
- Length of the grade.
- Steepness of the grade.
- Road conditions.
- Weather.

(2) Manually downshift the transmission into a lower gear before starting downgrade. (The general rule is to use the same gear to descend the grade that would be needed to climb the grade.)

(3) Check brakes before starting the downgrade.

(4) Set the engine brake switch to low. If more braking is needed, set the switch

to high.

NOTE: For detailed information on the use of the engine brake refer to the lesson outline, Operate Engine Brake (Jake Brake).

(5) Pay attention to signs indicating the location of escape ramps.

(6) When vehicle speed reaches the maximum "safe" speed, apply the brakes just hard enough to feel a definite slowdown.

(7) When the vehicle speed has been reduced to approximately 5 MPH below the "safe" speed, release the brakes. (This brake application should last for about 3 seconds.)

(8) When vehicle speed has increased to the "safe" speed, repeat steps (6) and (7).

(9) If braking power diminishes, pull off to the side of the road and allow the brakes to cool.

CAUTION

Excessive use of the service brake to control downhill speed will result in the loss of braking power because of heat buildup.

WARNING

Rapid operation repeatedly of service brakes will consume compressed air supply and cause automatic spring brake application. Failure to follow proper service brake operating procedures may cause serious injury or death to personnel.

e. Explain following distances--

(1) Maintain 1 second for each 10 feet of vehicle length (40 MPH and less). The HEMTT is 34 feet long, so at speeds of up to 40 MPH, allow 4 seconds following distance.

(2) Increase by 1 second for speeds over 40 MPH. At 45 MPH, with the HEMTT, allow 5 seconds following distance.

(3) Increase by several seconds for rain, fog, and winter conditions.

f. Explain maneuvering the vehicle--

(1) In curves.

(2) Through a constant curve.

(3) Through a U-turn.

(4) At intersections.

(5) At turns.

(a) Start to turn before reaching the intersection.

(b) Observe the rear of the truck through the mirrors (for stopped vehicles, signs, light poles, and so on.). Normally, the HEMTT will follow the front wheels with minimal off-tracking.

(6) When steering the vehicle.

NOTE: When driving the HEMTT at highway speeds, new drivers have the tendency to hug the edge of the road and oversteer. To correct this, check the position of the vehicle in the rear view mirrors, keep the vehicle centered in its lane, and make minor steering corrections.

(7) When making gradual steering corrections.

(8) To avoid abrupt steering movements.

(9) When passing stationary and moving vehicles.

g. Explain lane changing--

(1) Signal intentions.

(2) Check mirrors.

h. Explain driving in adverse weather conditions. Two major hazards associated in driving during adverse weather conditions are reduced visibility and reduced traction.

(1) Countermeasures for driving during periods of reduced visibility:

(a) Travel at reduced speeds and be prepared to meet sudden changes in road conditions.

(b) Do not use high beams. Switch to low beams if high beams are on.

(c) Look to the right if blinded by oncoming vehicles.

(d) Do not overrun the headlights and stay twice the normal distance from the vehicle ahead.

(e) Give turn signals sooner.

(f) Apply brakes sooner and press brake pedal lightly to give early warning that vehicle will slow or stop.

(g) Use defrosters and wipers to help keep the windshield clear.

(h) Keep windshield, windows, mirrors, headlights, brake lights, reflectors, and area around air cleaner intake free of snow and ice. Snow and ice may melt, refreeze, and cause restriction in the air intake systems.

(i) Watch for pedestrians and vehicles pulled over to the side of the road.

(j) Use caution when weather reduces visibility to near zero. This is particularly true at night in heavy snow, in a downpour of rain, or dense

fog. When this happens, it is unsafe to drive.

- Exit the highway, stop, and wait until visibility improves before continuing.

- Do not stop on the shoulder with flashers on. Stopping on shoulders may induce a rear end collision/chain reaction.

(2) Reduced traction countermeasures:

(a) Install tire chains, if needed, for snow or ice.

(b) Pump the brakes gradually when stopping the vehicle on snow and ice (pumping air brake vehicles may be dangerous, do not pump the brakes more than 3 to 4 times and allow the air pressure to build back up before reapplying the brakes). Sudden braking will cause wheels to lock and vehicle to slide out of control.

(c) Place the transmission shift lever and the transfer case shift lever in the appropriate driving range to descend or climb steep hills.

(d) Place the vehicle in motion slowly to prevent wheels from spinning.

(e) Press the accelerator pedal slowly when changing speed.

(f) Keep the accelerator pedal steady after vehicle reaches the desired speed.

(g) Turn the vehicle slowly and make gradual steering adjustments when on slippery surfaces.

(h) Steer the vehicle away from ruts and large snow banks.

(i) Steer the vehicle straight up and down hills if possible.

(j) Check for black ice. Black ice is clear and cannot be seen because the road surface is visible through the ice. The ice becomes invisible to the driver. Black ice usually occurs on bridges, beneath underpasses, in dips in the road, in shaded areas, and on lower sides of banked curves.

- When driving in rain or near freezing temperatures, feel for ice along the front of a mirror. If ice is there it may be on the road surface as well.

- When in doubt, test surface traction by first checking to see that nothing is following your vehicle, then slow down and apply the brakes gently to see if the vehicle skids.

(k) Use the following procedures if the vehicle's rear skids. Sudden changes in speed or direction result from over acceleration, over braking, and over steering. These changes result in skidding and jackknifing.

- Let up on the accelerator pedal.
- Steer in the same direction in which the rear of the vehicle is skidding.
- When vehicle is under control, press the brake pedal lightly.
- Steer vehicle on a straight course and slowly press the accelerator pedal.

(l) Do the following if the vehicle starts to slide while climbing a hill:

- Let up on the accelerator pedal.
- Steer the vehicle in the direction of the slide until the vehicle stops sliding.
- Slowly press the accelerator pedal and steer the vehicle on a straight course.

(m) The best advice in regard to a stuck vehicle is to avoid getting stuck. However, do the following if the vehicle does get stuck:

- Shovel clear path ahead of each wheel. Put boards, brush, sand, gravel, or similar material in cleared paths to get better traction.
- If additional power is needed to extract vehicle when mired in snow, place transmission in lowest forward gear range and transfer case (if equipped) in low range. Do not rock the vehicle or spin the wheels.
- If vehicle remains stuck, use wrecker or another vehicle equipped with winch to tow or winch the stuck vehicle.
- If vehicle is equipped with a self recovery winch, it may be used to help free the vehicle.

(n) Drive slowly and test brakes after driving through slush or water. If brakes slip do the following:

- Continue to drive slowly.
- Apply moderate pressure on brake pedal to cause slight brake drag.
- When brakes are dry and they no longer slip and uneven braking ceases, let up on the brake pedal.
- Resume normal driving speed.

(o) When driving during hot weather, adjust your driving for bleeding tar conditions on the roadway. Do the following to drive under these conditions:

- Frequently scan the roadway ahead.
- Identify a black tar area ahead.
- Maintain steady speed.
- Make no sudden steering maneuvers.
- Make no sudden braking maneuvers.
- If braking is required, ensure all wheels are on a similar surface.

i. Give safety briefing.

j. Explain ground guide safety precautions for backing the truck.

3. Practical exercise:

a. Assign students to vehicles and issue TM 9-2320-279-10-1, pencils, DA Form 2404, DD Form 1970, and equipment records folder. Instruct students on the location of rags, lubricants, and coolant.

b. Students perform before-operation PMCS.

c. Students practice driving the vehicle on the road (primary and secondary). During-operation PMCS is also conducted at this time.

NOTE: As each student practices driving, an assistant instructor rides in the right seat. The assistant instructor explains driving techniques, ensures the driver is aware of driving situations, and conducts AARs with each driver. Now is the time to pass on valuable experience and correct any bad driving habits.

d. Students perform after-operation PMCS. Ensure all operator entries required on DA Form 2404 and DD Form 1970 are accurate, complete, and legible.

4. Evaluate: Check each student's performance of PMCS and driving.

5. Summary:

a. Recap main points.

b. Allow for questions.

c. Clarify questions.

d. Give closing statement.

6. Retraining: Retrain NO-GOs and slow learners. Students perform driving tasks daily and are tested on the EOCCT.

E. SAFETY RESTRICTIONS.

1. Ensure that all chock blocks are in place when vehicles are parked or maintenance is to be performed.

2. Ensure the transmission is in N, the parking brake is set, and the engine is shut off before leaving the vehicle, when the vehicle is parked, or maintenance is being performed.

3. Ensure all personnel remove all wristwatches, rings, bracelets, neck chains, and any other jewelry before working in or around the HEMTT.

4. Ensure all personnel pay particular attention to the cautions and warnings listed in the operator's manuals.

5. Ensure the driver and ground guides know and understand the hand and arm signals, especially the signal to stop, as outlined in FM 21-305.

6. Ensure ground guide(s) are used when backing.

7. Ensure all backing is conducted at a speed of 5 MPH or less.

8. Do not park the vehicle on a steep grade. Serious injury or death can result or the vent on the M978 tanker may leak.

9. Ensure all personnel wear hearing protection when working in or around a running HEMTT.

10. Ensure all occupants wear seat belts while the vehicle is in operation.

11. Ensure personnel maintain at least three points of contact when mounting or dismounting the vehicle (to include performing PMCS).

12. The vehicle access ladder must be used when performing maintenance. The two hooks on the ladder must be installed in the front skid plate holes, right front fender holes, or left front fender holes as required. When installing or removing the access ladder to or from the right front fender holes, do not hit the fuel-water separator. Hitting the fuel-water separator could cause the glass to break.

13. The vehicle access ladder must be used to mount or dismount the HEMTT cargo body. Install the access ladder in the right front fender holes, climb the ladder, and step into the cargo bed from the right fender.

14. Ensure all personnel are clear of vehicle before engine start is attempted. Operator must visually check to see that all areas of the truck are clear of personnel before attempting to start the engine. Failure to do so could result in serious injury or death to personnel.

15. The radiator is very hot and pressurized during vehicle operation. Let the radiator cool before removing the cap. Failure to comply can result in serious burns.

16. The exhaust pipe and muffler can become very hot during vehicle operation. Be careful not to touch these parts with bare hands or allow the body to come in contact with the exhaust pipe or muffler. Exhaust system parts can become hot enough to cause serious burns.

17. Be careful not to short out battery terminals. Do not smoke or use open flame near batteries. Batteries may explode from a spark. Battery acid is harmful to skin and eyes.

18. Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep a fire extinguisher within easy reach when working with fuel. Do not work on the fuel system when the engine is hot. Fuel can be ignited by the hot engine. When working with fuel, post signs that read: "NO SMOKING WITHIN 50 FEET OF VEHICLE."

19. Apply brakes gradually when stopping. A panic stop will cause the vehicle wheels to lock, engine to stall, and power steering failure. Failure to do this can result in injury or death.

20. Rapid operation repeatedly of service brakes will consume compressed air supply and cause automatic spring brake application. Failure to follow proper service brake operating procedures may cause serious injury or death to personnel.

21. Never use the parking brake for normal braking. The wheels will lock up causing a severe skid. A skidding vehicle could result in serious injury or death.

22. Excessive use of the service brake to control downhill speed will result in the loss of braking power because of heat buildup.

23. Apply the engine brake only when vehicle tires have good traction. Use of the engine brake on slippery surfaces can cause the vehicle to skid and cause injury to personnel.

F. ADDITIONAL COMMENTS AND INFORMATION. Recommended instructional time is 16 hours (1.0 conference and 15.0 practical exercise, including 2.0 PMCS).

LESSON TITLE: DRIVE AN M977/M978 HEMTT OFF ROAD

TASK NUMBER: 551-721-1360 (Drive Cargo Vehicle on Side Roads and Unimproved Roads)

A. TRAINING OBJECTIVE.

TASK: Drive a loaded M977/M978 HEMTT and a partially loaded M978 HEMTT off road.

CONDITION: Given instruction, DD Form 1970, DA Form 2404, pencil, TM 9-2320-279-10-1, equipment records folder, rags, lubricants, coolant, a suitable training area, an M977/M978 HEMTT with BII, and a requirement to operate the vehicle off road (to include streams, ravines, gullies, ditches, wooded areas, rocky terrain, swamps, and mud).

STANDARDS: Operate the vehicle safely at reduced speeds and over rough terrain without damaging the vehicle.

B. INTERMEDIATE TRAINING. None.

C. ADMINISTRATIVE INSTRUCTIONS.

1. Training time: As scheduled.

2. Training location: Classroom, motor pool, and off road driver training area as scheduled.

3. Training type: Conference and practical exercise.

4. Students: Scheduled personnel.

5. Principal and assistant instructors required: One primary instructor for the conference and one assistant instructor for each student for the practical exercise.

6. Training aids and equipment: Television, VCR, TVT 55-26, rags, lubricants, coolant, DA Form 2404, DD Form 1970, pencil, TM 9-2320-279-10-1, equipment records folder, and an M977/M978 HEMTT with BII for each student.

7. References: AR 385-55, DA Pamphlet 738-750, FM 21-305, and TM 9-2320-279-10-1.

D. SEQUENCE OF ACTIVITY.

1. Introduction:

a. Interest device.

b. Tie-in.

c. Lesson objective (paragraph A).

d. Procedures:

(1) Explanation.

(2) Practical exercise.

(3) Summary.

2. Explanation and demonstration:

NOTE: An instructor will be in the cab whenever a student is driving the HEMTT.

a. As an option, show TVT 55-26, to reinforce driving tasks. This step may be deleted because the students should have viewed this TVT in earlier lessons.

b. In driving the HEMTT vehicle off road, there are two devices on the vehicle to give extra traction. These devices are the following:

(1) Transfer case shift lever. In LO range position, it gives the vehicle 8-wheel drive. Do not move the lever when the vehicle is moving or the transmission is in gear.

(2) Traction control lever. Set to 8X8 drive to give the vehicle all wheel drive (when the transfer lever is in HI). For maximum traction, it is set to INTER-AXLE DIFF. LOCK and the transfer case is in LO. This locks the intermediate axles together to pull at the same time. This can also be set to INTER-AXLE DIFF. LOCK when transfer case is in HI. Do not shift the traction control lever while the vehicle is moving. After the traction control lever is shifted, let the vehicle creep forward several feet to allow the shift collars to fully engage.

c. Shallow ditches require the following maneuvers:

(1) Stop the vehicle.

(2) Check the terrain for obstacles.

(3) Shift the transfer case shift lever and the traction control lever as needed to gain traction.

(4) Move the transmission range selector to 1.

(5) Slowly approach the ditch at an angle.

(6) Steer the vehicle toward the ditch so that one wheel on an axle will leave the ditch as the other wheel on the same axle enters it.

d. Deep ditches require the following driving techniques:

(1) Stop the vehicle.

(2) Check the terrain for obstructions.

(3) Cut away both sides of the ditch if necessary.

(4) Shift the transfer case shift lever and the traction control lever as needed to gain traction.

(5) Move the transmission shift lever to 1.

(6) Slowly approach the ditch at an angle.

(7) Accelerate the vehicle enough to keep it rolling as it goes up the other side.

e. Gullies and ravines require the following maneuvers:

(1) Stop the vehicle.

(2) Check the terrain for obstructions.

(3) Shift the transfer case shift lever and the traction control lever as needed to gain traction.

(4) Move the transmission shift lever to 1.

(5) Ease the front wheels over the edge and into the ravine or gully.

(6) Steer a straight course so both front wheels strike the bottom at the same time.

(7) Accelerate enough so that the vehicle can climb up the opposite bank.

f. Wooded area driving techniques include the following:

(1) Stop the vehicle.

(2) Check the terrain for obstructions.

(3) Remove tarps and bows as necessary.

(4) Shift the transfer case shift lever and the traction control lever as needed to gain traction.

(5) Move the transmission shift lever to 2 or 1 depending on the condition of the ground.

(6) Maneuver around obstructions.

g. Rocky terrain requires the following driving techniques:

(1) Stop the vehicle.

(2) Check the terrain for obstructions.

(3) Shift the transfer case shift lever and the traction control lever as needed to control vehicle speed and to gain traction.

(4) Move the transmission shift lever to 2 or 1 as needed.

(5) Drive slowly, maneuver around large boulders, and choose route while underway.

h. Fording streams calls for these handling techniques:

(1) Ensure the depth of the fording site is not more than 4 feet and the water flow of the stream is not too swift.

WARNING

Do not ford water unless depth is known. Water deeper than 4 feet may enter the vehicle causing personnel injury or death.

(2) Ensure the bottom at the fording site is firm enough that 4 feet maximum fording depth will not be exceeded and the vehicle will not become mired.

(3) Secure loose objects in the cab of the truck and check load security (past accidents have involved soldiers drowning because they were trapped by materials such as camouflage nets).

(4) Stop the vehicle at the edge of the water.

(5) If the brakes have been used heavily and are hot, allow drums and shoes to cool before entering the water if possible.

(6) Ensure the engine is operating correctly before entering the water.

(7) Set the transfer case shift lever to LO and the traction control lever to INTER-AXLE DIFF. LOCK.

(8) Move the transmission shift lever to 1.

(9) Drive the vehicle slowly into the water.

(10) If the engine stops, immediately attempt to restart the engine. If the vehicle will not start, tow or winch the vehicle from the water with another vehicle as soon as possible.

(11) Drive the truck at 3 to 4 MPH or less through water.

(12) Unless absolutely necessary, do not stop while in the water.

(13) Do the following if the vehicle accidentally enters water deeper than 4 feet (remember the height of the metal horizontal bar across the center of the floor window is 4 feet):

(a) Press on the brake pedal and hold to stop the vehicle.

(b) Move the transmission shift lever to R.

(c) Let up on the brake pedal.

(d) Slowly back the vehicle out of deep water.

(14) After leaving the water, press the brake pedal lightly and hold while driving slowly to dry out brake linings.

(15) When clear of the fording area, stop the vehicle, apply and release the parking brake several times to remove water from the brake components.

(16) Remove water and clean deposits from all vehicle parts as soon as possible.

(17) Lubricate, perform PMCS, and deliver vehicle to organizational maintenance as soon as possible.

i. Operating in sand requires the following techniques:

(1) Check air filter restriction indicator often.

(2) Adjust tire pressure.

(3) Set the transfer case shift lever to LO (this also engages 8X8 drive).

(4) Set the traction control lever to INTER-AXLE DIFF. LOCK for added traction.

(5) Set the transmission range selector to 2 or 1 as needed for added traction.

(6) Start slowly; do not spin the wheels when starting to move the vehicle.

(7) Do not straddle sand mounds or drive on the sides of two sand mounds. Loose sand will not support the vehicle on steep slopes.

(8) Keep the accelerator steady after the vehicle reaches the desired speed.

(9) Turn the vehicle slowly when on loose sand.

(10) Steer the vehicle straight up and down hills if possible.

(11) Do the following to move the vehicle forward and turn after the vehicle is stopped in loose sand:

(a) Set the transmission range selector to R.

(b) Press the accelerator pedal and move the vehicle straight back about 20 feet.

(c) Release the accelerator pedal and press the brake pedal.

(d) Set the transmission range selector to 1.

(e) Release the brake pedal and press the accelerator pedal to move the vehicle forward.

(f) Turn the vehicle gradually.

(g) Move the transmission range selector to D when the vehicle picks up speed and is moving forward smoothly.

j. Mud and swamps require the following driving techniques:

(1) Stop the vehicle and check the terrain for obstructions.

(2) Set the transfer case shift lever to LO and move the traction control lever to INTER-AXLE DIFF. LOCK.

(3) Move the transmission shift lever to 2 or 1 as needed.

(4) Drive through the area maintaining a steady speed.

k. Clean mud from wheels, brakes axles, universal joints, steering mechanism, and radiator as soon as possible. Make sure the axle breather vent caps move freely on breather body.

l. Give safety briefing, to include reinforcing ground guide safety procedures for backing the vehicle.

3. Practical exercise:

a. Assign students to vehicles and issue TM 9-2320-279-10-1, pencils, DA Form 2404, DD Form 1970, and equipment records folder. Instruct students on the location of rags, lubricants, and coolant.

b. Students perform before-operation PMCS.

c. Students practice driving the HEMTT off road. During-operation PMCS is conducted at this time.

NOTE: As each student practices driving, an assistant instructor rides in the right seat. The assistant instructor explains driving techniques, ensures the driver is aware of driving situations, and conducts AARs with each driver. Now is the time to pass on valuable experience and correct any bad driving habits.

d. Students perform after-operation PMCS and ensure all operator entries required on DA Form 2404 and DD Form 1970 are accurate, complete, and legible.

4. Evaluation: Check each student's performance of PMCS and off road driving.

5. Summary:

a. Recap main points.

b. Allow for questions.

c. Clarify questions.

d. Closing statement.

6. Retrain NO-GOs and slow learners. This can be accomplished using TVT 55-26 and reinforced with additional off road driving. Students are tested on the EOCCT.

E. SAFETY RESTRICTIONS.

1. Ensure that all chock blocks are in place when vehicles are parked or maintenance is to be performed.

2. Ensure the transmission is in N, the parking brake is set, and the engine is shut off before leaving the vehicle, when the vehicle is parked, or maintenance is being performed.

3. Ensure all personnel remove all wristwatches, rings, bracelets, neck chains, and any other jewelry before working in or around the HEMTT.

4. Ensure all personnel pay particular attention to the cautions and warnings listed in the operator's manuals.

5. Ensure the driver and ground guides know and understand the hand and arm signals, especially the signal to stop, as outlined in FM 21-305.

6. Ensure ground guide(s) are used when backing.

7. Ensure all backing is conducted at a speed of 5 MPH or less.

8. Do not park the vehicle on a steep grade. Serious injury or death can result or the vent on the M978 tanker may leak.

9. Ensure all personnel wear hearing protection when working in or around a running HEMTT.

10. Ensure all occupants wear seat belts while the vehicle is in operation.

11. Ensure personnel maintain at least three points of contact when mounting or dismounting the vehicle (to include performing PMCS).

12. The vehicle access ladder must be used when performing maintenance. The two hooks on the ladder must be installed in the front skid plate holes, right front fender holes, or left front fender holes as required. When installing or removing the access ladder to or from the right front fender holes, do not hit the fuel-water separator. Hitting the fuel-water separator could cause the glass to break.

13. The vehicle access ladder must be used to mount or dismount the HEMTT cargo body. Install the access ladder in the right front fender holes, climb the ladder, and step into the cargo bed from the right fender.

14. Ensure all personnel are clear of vehicle before engine start is attempted. Operator must visually check to see that all areas of the truck are clear of personnel before attempting to start the engine. Failure to do so could result in serious injury or death to personnel.

15. The radiator is very hot and pressurized during vehicle operation. Let the radiator cool before removing the cap. Failure to comply can result in serious burns.

16. The exhaust pipe and muffler can become very hot during vehicle operation. Be careful not to touch these parts with bare hands or allow the body to come in contact with the exhaust pipe or muffler. Exhaust system parts can become hot enough to cause serious burns.

17. Be careful not to short out battery terminals. Do not smoke or use open flame near batteries. Batteries may explode from a spark. Battery acid is harmful to skin and eyes.

18. Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep a fire extinguisher within easy reach when working with fuel. Do not work on the fuel system when the engine is hot. Fuel can be ignited by the hot engine. When working with fuel, post signs that read: "NO SMOKING WITHIN 50 FEET OF VEHICLE."

19. Apply brakes gradually when stopping. A panic stop will cause the vehicle wheels to lock, engine to stall, and power steering failure. Failure to do this could result in injury or death.

20. Rapid operation repeatedly of service brakes will consume compressed air supply and cause automatic spring brake application. Failure to follow proper service brake operating procedures may cause serious injury or death to personnel.

21. Never use the parking brake for normal braking. The wheels will lock up causing a severe skid. A skidding vehicle could result in serious injury or death.

22. Excessive use of the service brake to control downhill speed will result in the loss of braking power because of heat buildup.

23. Apply the engine brake only when vehicle tires have good traction. Use of the engine brake on slippery surfaces can cause the vehicle to skid and cause injury to personnel.

24. Ensure students maintain a safe following distance and speed limit when driving on the off road driving course (as determined by the local command).

F. ADDITIONAL COMMENTS AND INFORMATION. Recommended instructional time is 6 hours (.5 conference and 5.5 hours practical exercise, including 1.0 PMCS).

LESSON TITLE: DRIVE THE HEMTT AT NIGHT

TASK NUMBER: 551-721-1366 (Drive Vehicle with Automatic Transmission)

A. TRAINING OBJECTIVE.

TASK: Drive an M977/M978 HEMTT at night.

CONDITION: Given instruction, DD Form 1970, DA Form 2404, pencil, TM 9-2320-279-10-1, equipment records folder, rags, lubricants, coolant, designated driving route (improved surfaced and secondary roads), an M977/M978 HEMTT with BII, and a requirement to drive the designated route at night with headlights; use defensive driving (accident avoidance) methods, operate the light switch, read gauges, upshift and downshift the transmission, manipulate the controls, use correct braking procedures, and perform basic driving maneuvers.

STANDARDS: Operate the vehicle correctly and safely without accident or injury according to TM 9-2320-279-10-1.

B. INTERMEDIATE TRAINING. None.

C. ADMINISTRATIVE INSTRUCTIONS.

1. Training time: As scheduled.

2. Training location: Motor pool and driver training route (built-up and rural areas) as scheduled.

3. Training type: Conference and practical exercise.

4. Students: Scheduled personnel.

5. Principal and assistant instructors required: One primary instructor for the conference and one assistant instructor for each student for the practical exercise.

6. Training aids and equipment: Rags, lubricants, coolant, DA Form 2404, DD Form 1970, pencil, TM 9-2320-279-10-1, equipment records folder, and an M977/M978 HEMTT with BII for each student.

7. References: AR 385-55, DA Pamphlet 738-750, FM 21-305, and TM 9-2320-279-10-1.

D. SEQUENCE OF ACTIVITY.

1. Introduction:

a. Interest device.

b. Tie-in.

c. Lesson objective (paragraph A).

d. Procedures.

(1) Explanation.

(2) Practical exercise.

(3) Summary.

2. Explanation and demonstration:

NOTE: An instructor will be in the cab whenever a student is driving the HEMTT.

NOTE: Students are licensed on other military vehicles and should only require refresher training on night driving factors and procedures.

a. Night driving factors.

(1) Driver factors:

(a) Vision. The driver has limited vision at night because of the following:

- Eyes need time to adjust to the change between light and darkness.
- Drivers cannot see as sharply at night.
- Drivers cannot see to the sides as well at night.

(b) Glare. Temporary blindness is caused by glare, normally from oncoming headlights but sometimes from other lights.

(c) Fatigue. Reduces the ability to see clearly. The driver becomes less alert, slower to see hazards, and does not react as promptly.

(d) Driver inexperience. Newness to driving, coupled with the problems of reduced vision, glare, and fatigue account for the fact new drivers have higher nighttime accident rates than more experienced drivers.

(2) Roadway factors:

(a) Low illumination. Illumination provided by street lights is often only fair to poor. On most roads, the only illumination is from the driver's headlights. Headlights are useful for a relatively short and narrow path directly ahead of the vehicle. Headlights do not bend around corners.

(b) Variation in illumination. The driver must constantly adjust his eyes to different types and degrees of lighting. Flashing lights distract as much as they illuminate. Traffic signs are hard to see against the background of other lights especially in towns and cities.

(c) Familiarity with roads. The driver needs to be particularly alert on roads that he has never driven during the day. On familiar roads, drivers tend to be overconfident. This is dangerous because of the following:

- The view of the roadway is not the same.
- Situations on some stretches will change.

(d) Other road users. The driver must adjust his driving to hazards such as pedestrians, joggers, bicyclists, and animals.

(e) Drinking drivers. The likelihood of encountering drunken drivers increases after sundown. Be especially alert when driving near roadside taverns and similar attractions.

(3) Vehicle factors:

(a) Headlights. Sight distance is limited to the range of the headlights. Therefore, the driver must drive at a speed that allows him to stop within his sight distance.

(b) Auxiliary lights. Trucks are better seen at night by other drivers when reflectors, marker lights, clearance lights, tail lights, and brake lights are clean and working properly.

(c) Turn signals. The ability to communicate with other drivers depends on turn signals. Nonfunctional or dirty turn signal lights greatly increase the risk of an accident.

(d) Windshield and wipers. A clean windshield and properly working wipers are a must for safe driving.

(e) Mirrors. Mirrors help the driver see what is going on around him. Keep them clean and properly adjusted.

b. Night driving procedures.

(1) Preparing to drive at night:

(a) Getting yourself ready.

- If you wear glasses, be sure they are clean.
- Remove sunglasses.
- Be well rested.

(b) Plan your route.

- Know the location of rest stops.
- Plan for hazards such as unlighted areas, exit ramps, construction areas, and other changes in the highway environment.

(c) Getting the vehicle ready.

- Ensure windshield, mirrors, lights, and reflectors are clean.

- Ensure all lights are operational.

(2) Driving at night:

(a) Avoid blinding others.

- Dim high beams when oncoming vehicles are less than 500 feet away.
- Do not use high beams to retaliate against other drivers.

(b) Avoid glare.

- Set interior panel lights at the lowest setting to reduce glare.
- Look to the right when oncoming vehicles are using high beams.

(c) Maximize visibility.

- Use low beams when desired visual range is about 250 feet.
- Use high beams when there are no oncoming vehicles and desired visual range is 350 to 500 feet.

(d) Adjust basic driving techniques.

- Exercise additional caution because of reduced vision.
- Signal earlier than you would during daylight to give other drivers more time to react.

3. Practical exercise:

a. Assign students to vehicles and issue TM 9-2320-279-10-1, pencils, DA Form 2404, DD Form 1970, and equipment records folder. Instruct students on the location of rags, lubricants, and coolant.

b. Students perform before-operation PMCS to include the operation and cleanliness of all lights.

c. Give safety briefing with emphasis on safety precautions for night operations.

d. Students drive the designated route. During-operation PMCS is also conducted at this time.

NOTE: As each student practices driving, an assistant instructor rides in the right seat. The assistant instructor explains driving techniques, ensures the driver is aware of driving situations, and conducts AARs with each driver. Now is the time to pass on valuable experience and correct any bad driving habits.

e. Students perform after-operation PMCS and ensure all operator entries required on DA Form 2404 and DD Form 1970 are accurate, complete, and legible.

4. Evaluation: Check each student's performance of PMCS and night driving.

5. Summary:

a. Recap main points.

b. Allow for questions.

c. Clarify questions.

d. Give closing statement.

6. Retraining: Retrain NO-GOs and slow learners.

E. SAFETY RESTRICTIONS.

1. Ensure that all chock blocks are in place when vehicles are parked or maintenance is to be performed.

2. Ensure the transmission is in N, the parking brake is set, and the engine is shut off before leaving the vehicle, when the vehicle is parked, or maintenance is being performed.

3. Ensure all personnel remove all wristwatches, rings, bracelets, neck chains, and any other jewelry before working in or around the HEMTT.

4. Ensure all personnel pay particular attention to the cautions and warnings listed in the operator's manuals.

5. Ensure the driver and ground guides know and understand the hand and arm signals, especially the signal to stop, as outlined in FM 21-305.

6. Ensure ground guide(s) are used when backing.

7. Ensure all backing is conducted at a speed of 5 MPH or less.

8. Do not park the vehicle on a steep grade. Serious injury or death can result or the vent on the M978 tanker may leak.

9. Ensure all personnel wear hearing protection when working in or around a running HEMTT.

10. Ensure all occupants wear seat belts while the vehicle is in operation.

11. Ensure personnel maintain at least three points of contact when mounting or dismounting the vehicle (to include performing PMCS).

12. The vehicle access ladder must be used when performing maintenance. The two hooks on the ladder must be installed in the front skid plate holes, right front fender holes, or left front fender holes as required. When installing or removing the access ladder to or from the right front fender holes, do not hit the fuel-water separator. Hitting the fuel-water separator could cause the glass to break.

13. The vehicle access ladder must be used to mount or dismount the HEMTT cargo body. Install the access ladder in the right front fender holes, climb the ladder, and step into the cargo bed from the right fender.

14. Ensure all personnel are clear of vehicle before engine start is attempted. Operator must visually check to see that all areas of the truck are clear of personnel before attempting to start the engine. Failure to do so could result in serious injury or death to personnel.

15. The radiator is very hot and pressurized during vehicle operation. Let the radiator cool before removing the cap. Failure to comply can result in serious burns.

16. The exhaust pipe and muffler can become very hot during vehicle operation. Be careful not to touch these parts with bare hands or allow the body to come in contact with the exhaust pipe or muffler. Exhaust system parts can become hot enough to cause serious burns.

17. Be careful not to short out battery terminals. Do not smoke or use open flame near batteries. Batteries may explode from a spark. Battery acid is harmful to skin and eyes.

18. Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep a fire extinguisher within easy reach when working with fuel. Do not work on the fuel system when the engine is hot. Fuel can be ignited by the hot engine. When working with fuel, post signs that read: "NO SMOKING WITHIN 50 FEET OF VEHICLE."

19. Apply brakes gradually when stopping. A panic stop will cause the vehicle wheels to lock, engine to stall, and power steering failure. Failure to do this could result in injury or death.

20. Rapid operation repeatedly of service brakes will consume compressed air supply and cause automatic spring brake application. Failure to follow proper service brake operating procedures may cause serious injury or death to personnel.

21. Never use the parking brake for normal braking. The wheels will lock up causing a severe skid. A skidding vehicle could result in serious injury or death.

22. Excessive use of the service brake to control downhill speed will result in the loss of braking power because of heat buildup.

23. Apply the engine brake only when vehicle tires have good traction. Use of the engine brake on slippery surfaces can cause the vehicle to skid and cause injury to personnel.

24. Ensure a safe following distance and speed are maintained when driving on the designated route (as determined by the local command).

F. ADDITIONAL COMMENTS AND INFORMATION. Recommended instructional time is 5 hours (.5 conference and 4.5 practical exercise, including 1.0 PMCS).

LESSON TITLE: CHANGE TIRE ON HEMTT USING TIRE DAVIT

TASK NUMBER: 551-721-1352 (Perform Vehicle Preventive Maintenance Checks and Services [PMCS])

A. TRAINING OBJECTIVE.

TASK: Change a tire on the HEMTT using the tire davit.

CONDITION: Given instruction, TM 9-2320-279-10-1, rags, heavy work gloves, hearing protection, an M977/M978 with BII, and a requirement to change a simulated flat tire on the truck.

STANDARDS: Perform task in the correct sequence according to TM 9-2320-279-10-1 and without damage to equipment or injury to personnel. Students will be graded on a GO/NO-GO basis.

B. INTERMEDIATE TRAINING. None.

C. ADMINISTRATIVE INSTRUCTIONS.

1. Training time: As scheduled.

2. Training location: Training area or motor pool as scheduled.

3. Training type: Demonstration and practical exercise.

4. Students: Scheduled personnel.

5. Principal and assistant instructors required: One primary instructor for the class, one assistant instructor for every six students for the demonstration, and one assistant instructor for every two students for the practical exercise.

6. Training aids and equipment: Rags, heavy work gloves, TM 9-2320-279-10-1, and an M977/M978 HEMTT with BII for every two students. Hearing protection is required for all personnel.

7. References: TM 9-2320-279-10-1.

D. SEQUENCE OF ACTIVITY.

1. Introduction:

a. Interest device.

b. Tie-in.

c. Lesson objective (paragraph A).

d. Procedures.

(1) Explanation.

(2) Practical exercise.

(3) Summary.

2. Explanation and demonstration:

NOTE: Changing a tire on the HEMTT is a two-soldier task. One soldier cannot safely do this task.

a. Review safety warnings.

b. Park the vehicle.

(1) Park the vehicle in a safe area, out of traffic, where there is no traffic danger to personnel changing the tire. Also, the vehicle must be parked on hard, level ground.

(2) Set the parking brake, shift the transmission range selector to N, and shut off the engine.

(3) Turn on emergency flashers as dictated by traffic hazards.

(4) Position emergency reflective triangles as dictated by traffic hazards.

(5) Chock the wheels. It is best to chock a front wheel on the opposite side of the vehicle. For example, if the right front tire of axle one were flat, chock the left front tire of axle two, front and rear of the tire, to prevent movement in either direction.

c. Tools. Remove all necessary tools from vehicle and vehicle stowage boxes (jack, jack handle extension, jack plate, adjustable wrench, wrench handle, and wheel lugnut wrench).

d. Set up tire davit.

(1) Remove the hoist arm from the mounting bracket.

(2) Install the hoist arm in the tire davit mount.

(3) Remove and keep the safety pin and securing pin from the hoist arm.

(4) Remove the nut, washer, and extension from the tire davit mount.

(5) Install the extension on the hoist arm. Line up the holes in the extension and hoist arm and install the securing pin and safety pin.

WARNING

Ensure all personnel wear protective gloves at all times when handling the spare tire winch cable. The cable may fray and injury to personnel may result.

(6) Turn the handcrank on the hoist arm counterclockwise and route the cable over the end of the pulley.

e. Position jack and remove the spare tire.

(1) Position the jack base plate, jack, and handle under the vehicle equalizer

beam nearest the flat tire.

(2) If the vehicle is sitting too low for the jack to fit under the equalizer beam, the vehicle must be driven onto a chock block so that the chock block is under the flat tire. This will raise the vehicle and allow enough space for the jack to fit under the equalizer beam.

(3) Unscrew the jack ram until it touches the equalizer beam approximately 4 to 5 inches from the beam center pivot point.

(4) Position the vehicle ladder on the right side of the vehicle, climb the ladder, and get in position by the tire davit.

WARNING

Ensure all personnel wear protective gloves at all times when handling the spare tire winch cable. The cable may fray and injury to personnel may result.

(5) Turn handcrank counterclockwise to let out enough cable to push through the wheel and wrap around the spare tire.

CAUTION

Never run the cable through the slot that has the valve stem. The cable might damage the valve stem causing the spare tire to lose air.

(6) If the slot in the rim is positioned at the top of the spare tire (12 o'clock position), route the cable through the slot, around the spare tire, and secure with the hook. Do not use this slot if the valve stem is positioned here. If the slot is not positioned at the top or the valve stem is positioned here, route the cable through the axle hole, around the spare tire, and secure with the hook.

(7) Turn the handcrank clockwise to put light tension on the cable.

(8) Release the clamp and disconnect the tiedown strap from the bracket on both sides of the spare tire.

(9) Hook the tiedown strap through the lugnut holes on both sides of the spare tire. The strap will be used later to guide the spare tire.

(10) Turn the handcrank counterclockwise and remove the spare tire lever and holddown plate. Keep the lever and holddown plate to use later when mounting the flat tire.

WARNING

Stand clear of the tire when raising or lowering. Do not let the tire hang in midair for a long period of time. Place the tire on the carrier or on the ground as soon as possible. The tire is very heavy and could cause serious injury or death if it falls.

NOTE: One soldier stands on the right fender to operate the tire davit winch while the other soldier stands on the ground near the second axle to guide the tire assembly down.

(11) Remove the vehicle access ladder from the right fender and set it out of the way.

(12) Turn the handcrank clockwise to lift the spare tire just above the carrier.

(13) The driver swings the hoist arm so the spare tire is clear of the vehicle while the assistant driver pulls on the tiedown strap to guide the spare tire out of the carrier.

(14) The driver turns the handcrank counterclockwise to lower the spare tire to the ground.

(15) Remove the tiedown strap.

(16) Push the spare tire against the vehicle.

(17) Remove the cable from the spare tire and roll the spare tire next to the axle of the flat tire.

(18) Check the spare tire air pressure and adjust air pressure as required.

f. Remove flat tire or wheel.

(1) Using the wheel lugnut wrench and handle, loosen the 10 lugnuts until they turn easily.

NOTE: Studs and lugnuts on the left side of the vehicle have left-hand threads. Rotate lugnuts clockwise to loosen, counterclockwise to tighten. Studs and lugnuts on the right side of the vehicle have right-hand threads. Rotate lugnuts counterclockwise to loosen, clockwise to tighten.

(2) Raise the jack until the flat tire is slightly off the ground.

NOTE: If wheel chock was used to help position the jack (under flat tire), the tire does not have to be clear of the chock.

WARNING

One soldier should steady the tire during removal. A falling tire may cause injury or death.

(3) Remove the 10 lugnuts from the studs. Set the lugnuts aside.

NOTE: If wheel chock was not used to position jack, skip step (4).

(4) Remove wheel chock and put in stowage.

(5) Using jack, lower the vehicle until the flat tire is just touching the ground.

(6) One soldier tilts the top of the flat tire forward, while the other soldier raises the jack slightly. The tire should move forward.

(7) Repeat steps (5) and (6) to walk the flat tire off the studs. The wheel lugnut wrench handle may be used under the tire to assist sliding or creeping wheel away from the hub.

(8) Remove the flat tire and lean the flat tire against the vehicle out of the way.

g. Install spare tire and wheel.

NOTE: Tire tread is nondirectional. Vehicle operation is not affected by the direction of traction bars.

(1) Roll the spare tire up to the axle where the flat tire was removed.

NOTE: Check that the spare tire wheel dish is in the same position as the flat tire wheel dish. Deep side of the wheel dish will face toward the vehicle on the four front wheels. Deep side of the wheel dish will face away from the vehicle on the four rear wheels except the M984E1. All eight wheels on the M984E1 are installed with the deep side of the wheel dish facing toward the vehicle.

(2) Make sure the deep side of the spare tire wheel dish is in the same position as the flat tire wheel dish when the flat tire was removed.

NOTE: The tire valve stem can be rotated in wheel so it points out away from the vehicle. The valve cap must be removed to rotate the valve stem.

(3) Make sure the tire valve stem is pointing out away from the vehicle.

(4) Line up the holes in the spare tire with the studs.

WARNING

The tire assembly is very heavy. Do not try to lift or catch the tire assembly. Injury to personnel could result.

(5) Lean the top of the spare tire against the studs and axle.

WARNING

The jack is under heavy pressure. Keep hand, arm, and head clear while slowly raising or lowering the jack to avoid injury to personnel. Do not lower the jack too quickly as the tire could fall causing serious injury or death.

(6) Slide the spare tire onto the hub and studs. The jack may have to be raised slightly to accommodate the spare tire. The wheel lugnut wrench handle may be placed near the bottom of the tire to either side and raised up to move the tire forward on the hub and studs.

(7) Continue with step (6) until the spare tire is seated on the axle and studs.

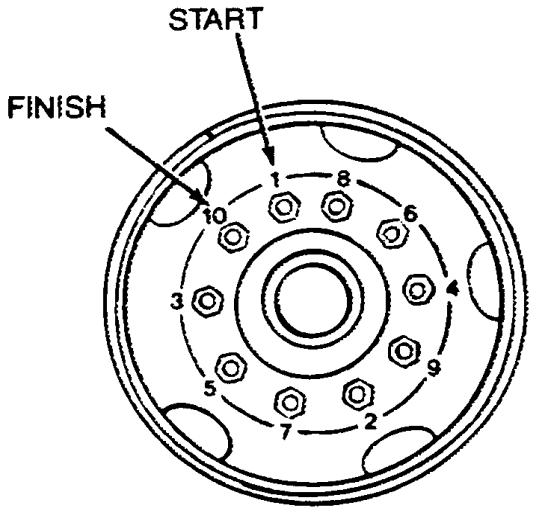
NOTE: Studs and lugnuts on the left side of the vehicle have left-hand threads. Rotate lugnuts clockwise to loosen, counterclockwise to tighten. Studs and lugnuts on the right side of the vehicle have right-hand threads. Rotate lugnuts counterclockwise to loosen, clockwise to tighten.

(8) Install and tighten the 10 lugnuts using the wheel lugnut wrench to tighten in the sequence as shown.

(9) Use the jack to carefully lower the vehicle to the ground.

(10) Remove the jack and the jack base plate from under the equalizer beam.

(11) Tighten the 10 lugnuts in order as shown until they no longer tighten.



h. Stow tire using the tire davit.

(1) Roll flat tire under hoist arm so deep side of wheel dish is facing out and away from the vehicle.

NOTE: One soldier stands on the right fender to operate the tire davit winch while the other soldier stands on the ground near the second axle to guide the tire assembly into the carrier.

(2) Turn the handcrank on the hoist arm counterclockwise to let out cable.

(3) Pull tiedown strap through the wheel and hook the ends to hole on both sides of the wheel.

CAUTION

Never run the cable through the slot that has the valve stem. The cable might damage the valve stem causing the spare tire to lose air.

WARNING

Ensure all personnel wear protective gloves at all times when handling the spare tire winch cable. The cable may fray and injury to personnel may result.

(4) Route the cable through the slot in the rim that is positioned at the top of the spare tire (12 o'clock position). Continue to route the cable through the slot and around the flat tire.

(5) Attach the hook to the cable above the flat tire.

WARNING

Stand clear of the tire when raising or lowering. Do not let the tire hang in midair for a long period of time. Place the tire on the carrier or on the ground as soon as possible. The tire is very heavy and could cause serious injury or death if it falls.

(6) One soldier turns the handcrank clockwise to raise the flat tire just above the carrier while the other soldier holds the tiedown strap to steady the tire.

(7) One soldier swings the hoist arm so the flat tire is over the carrier while the other soldier guides the tire with the tiedown strap.

(8) Turn the handcrank counterclockwise to lower the flat tire into the carrier.

(9) Remove the tiedown strap.

(10) One soldier holds the flat tire steady, while the other soldier installs the holddown plate, the lever, and turns the lever clockwise to tighten.

(11) Slide the tiedown strap through the wheel.

(12) The soldier on the ground connects the tiedown strap to the outside holddown bracket while the soldier on the vehicle connects the tiedown strap to the inside holddown bracket.

(13) Pull the latch down on the tiedown strap and lock to secure the flat tire.

(14) Turn the handcrank on the hoist arm counterclockwise to loosen the cable.

(15) Remove the hook from the lift cable and the lift cable from around the tire.

(16) Turn the handcrank clockwise and wind the cable fully onto the reel.

i. Stow tire davit winch.

(1) Remove the safety pin and securing pin from the extension.

(2) Pull the extension from the hoist arm.

(3) Install the extension on the mount.

(4) Slide the top of the extension over the stud on the mount.

(5) Secure the extension by installing the washer and nut on the stud.

(6) Pull the hoist arm from the mount.

(7) Put the hoist arm into the mounting bracket.

(8) Install the securing pin through the hoist arm and secure with the safety pin.

j. Prepare vehicle for driving.

(1) Return all tools and wheel chocks to stowage boxes or locations.

(2) Stow vehicle access ladder.

(3) Pick up and stow highway safety markers.

(4) At the earliest opportunity, have unit maintenance torque all nuts and bolts

that were loosened during the tire changing procedure and repair or replace spare tire.

3. Practical exercise:

a. Assign two students to each vehicle and issue TM 9-2320-279-10-1.

b. Students practice changing simulated flat tires.

4. Evaluation: Check each student's performance.

5. Summary:

a. Recap main points.

b. Allow for questions.

c. Clarify questions.

d. Give closing statement.

6. Retraining: Retrain NO-GOs and slow learners.

E. SAFETY RESTRICTIONS.

1. Ensure that all chock blocks are in place when vehicles are parked or maintenance is to be performed.

2. Ensure the transmission is in N, the parking brake is set, and the engine is shut off before leaving the vehicle, when the vehicle is parked, or maintenance is being performed.

3. Ensure all personnel remove all wristwatches, rings, bracelets, neck chains, and any other jewelry before working in or around the HEMTT.

4. Ensure all personnel pay particular attention to the cautions and warnings listed in the operator's manuals.

5. Ensure the driver and ground guides know and understand the hand and arm signals, especially the signal to stop, as outlined in FM 21-305.

6. Ensure ground guide(s) are used when backing.

7. Ensure all backing is conducted at a speed of 5 MPH or less.

8. Do not park the vehicle on a steep grade. Serious injury or death can result or the vent on the M978 tanker may leak.

9. Ensure all personnel wear hearing protection when working in or around a running HEMTT.

10. Ensure all occupants wear seat belts while the vehicle is in operation.

11. Ensure personnel maintain at least three points of contact when mounting or dismounting the vehicle (to include performing PMCS).

12. The vehicle access ladder must be used when performing maintenance. The two hooks on the ladder must be installed in the front skid plate holes, right front fender holes, or left front fender holes as required. When installing or removing the access ladder to or from the right front fender holes, do not hit the fuel-water separator. Hitting the fuel-water separator could cause the glass to break.

13. The vehicle access ladder must be used to mount or dismount the HEMTT cargo body. Install the access ladder in the right front fender holes, climb the ladder, and step into the cargo bed from the right fender.

14. Ensure all personnel are clear of vehicle before engine start is attempted. Operator must visually check to see that all areas of the truck are clear of personnel before attempting to start the engine. Failure to do so could result in serious injury or death to personnel.

15. Stand clear of the tire when raising or lowering. Do not let the tire hang in midair for a long period of time. Place the tire on the carrier or on the ground as soon as possible. The tire is very heavy and could cause serious injury or death if it falls.

16. One soldier should steady the tire during removal. A falling tire may cause injury or death.

17. The tire assembly is very heavy. Do not try to lift or catch the tire assembly. Injury to personnel could result.

18. Ensure all personnel wear protective gloves at all times when handling the spare tire winch cable. The cable may fray and injury to personnel may result.

19. Jack is under heavy pressure. Keep hand, arm, and head clear while slowly raising or lowering jack to avoid injury to personnel. Do not lower jack too quickly as tire could fall, causing serious injury or death.

F. ADDITIONAL COMMENTS AND INFORMATION. Recommended instructional time is 4.0 hours (1.0 demonstration and 3.0 practical exercise).